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Raman Spectroscopy and Light Scattering Technologies in Materials Science, D. L. Andrews, Chair

Title: Fiber Raman and reflectance spectroscopy for planetary mineralogy

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Abstract:

Raman spectroscopy is a core analytical technique for the identification of materials, including biological agents and minerals. Yet, the benefits of the signal specificity in Raman spectroscopy must be balanced against its relatively low signal to noise ratio, and the rather stringent requirements it places on the rejection of the excitation light. In mineralogy applications, an alternative technique is reflection spectroscopy, in which the identification of a particular specie is done through the examination of an often broad, continuous spectrum, with excellent signal to noise. This technique has proved enormously successful in remote sensing of the earth surface. In planetary science, the design specifications for any instrument are further compounded by the need for low power consumption, and miniaturization.

In this paper we discuss the design and operation of two new systems for Raman and reflection spectroscopy, and their application to mineralogy. Both systems have a fiber-optic framework, and utilize an extremely compact all reflective spectrometer design using a convex blazed grating. The systems are intended to be complementary, providing sample identification on different resolution scales. The various performance aspects of these systems are compared.

Key words: Raman spectroscopy; reflectance spectroscopy; in situ instrument; mineralogy

Author Biography: Mehdi Vaez-Iravani is a Principal Engineer at the Jet Propulsion Laboratory, California Institute of Technology, where he is involved in the design of in situ instrumentation. He has authored and co-authored a variety of papers in the areas of microscopy, interferometry, and sensors.